



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: **Hidehiko FUNAOKA et al.**

Group Art Unit: 1771

Serial No.: 09/806,309

Examiner: **Victor S. CHANG**

Filed: **July 6, 2001**

Confirmation No.: 6699

For: **MICROPOROUS POLYOLEFIN MEMBRANE, AND METHOD OF PRODUCING THE SAME**

Attorney Docket No.: **010311**

Customer Number: **38834**

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

June 8, 2004

Sir:

I, Tokaro Takita, hereby declare as follows:

- 1) I am over the age of eighteen and am legally competent to affirm this declaration.
- 2) I am a citizen of Japan.
- 3) In 1987 I graduated with a Degree from Meiji University.
- 4) From 1987 to the present, I have been employed by Tonen Chemical Corporation where my work duties include research and development on microporous film.
- 5) I have reviewed the materials consisting of U.S. Patent No. 4,588,633 to Kono et al. and am familiar therewith. I consider myself one skilled in the art in regard to the technology of this application.

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6) I have performed or directly supervised the following Experiments to show that the directivity (%) of lamella to the direction perpendicular to the membrane surface in U.S. Patent No. 4,588,633 (Kono et al.) is lower than the claimed directivity, and consequently that the air permeability of the resultant microporous polyolefin membrane is poor.

Objective of the Experiments

The objective of the experiments is to show that the directivity (%) of lamellas to the direction perpendicular to the membrane surface prepared as taught in U.S. Patent No. 4,588,633 (Kono et al.) is low, so that the air permeability of the resultant microporous polyolefin membrane is poor.

Experimental method and materials

Reworking EXAMPLE 2 of Kono et al. (see column 5, lines 15 to 21 and Table 1 of Kono et al.) was conducted, and the resultant microporous polyolefin membrane was evaluated with respect to the directivity (%) of lamellas to the direction perpendicular to the membrane as well as the air permeability.

To 100 parts by weight of liquid paraffin (51 cSt/40°C, Crystol N262 manufactured and sold by Exxon Mobil Corporation) containing 4.0% by weight of polyethylene having a weight-average molecular weight of 2×10^6 (HI-ZEX Million 240M manufactured and sold by Mitsui Chemicals) were added 0.125 part by weight of 2,6-di-t-butyl-p-cresol and 0.25 part by weight of tetrakis(methylene-3- (3,5-di-t-butyl-4-hydroxyphenyl)-propionate)methane, as antioxidants and mixed. The mixture was charged in an autoclave equipped with a stirrer and heated at 200°C with agitation for 90 minutes to form a homogeneous solution.

In EXAMPLE 2 of Kono et al., a liquid paraffin with a viscosity of 64 cSt/40°C was used. However, currently, this liquid paraffin is not commercially available. For this reason, a liquid paraffin with a closest viscosity to 64 cSt/40°C was used in this experiment, among commercially available liquid paraffins. It is the Declarant's opinion that the minor difference in viscosity

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between the liquid paraffin as used in the present experiments and those used in Kono et al. would not result in the property variation as seen in the results.

The homogeneous solution thus obtained was charged in a heated metal mold, rapidly cooled to 15°C and formed in to a gel sheet with a thickness of 2 mm. This gel sheet was immersed in 250 ml of methylene chloride for 60 minutes, and then subjected to evaporation of the methylene chloride while putting it on a smooth plate. The base stock sheet thus obtained contained 24.2% by weight of liquid paraffin and experienced shrinkage of 90% in the thickness direction.

The resulting base stock sheet was cut in a size of 9 x 9 cm, set in a biaxial stretching machine and then subjected to simultaneous biaxial stretching at a temperature of 130°C with a stretching ration of 5 x 5. The thus stretched membrane washed with methylene chloride to extract and remove the residual liquid paraffin and then dried to obtain a polyethylene microporous membrane. After drying, the stretched membrane was thermally treated at 120°C for 10 minutes in order to avoid the shrinkage.

Evaluation of the obtained thermally-set microporous membrane was conducted in the same manner as described at page 17, line 11 to page 18, line 11 of the present specification.

Results of the Experiments

The thickness of the obtained thermally-set membrane (film) was 2.9 μm on average, and the air permeability of the obtained membrane measured in accordance with JIS P8117 was as low as 1353 seconds/100 cc.

With respect to the obtained membrane (film), a total of 100 lamellas were selected from a transmission electron micrographs (TEM, magnification: 100,000) of the cross section cut in the mechanical direction, and the proportion of those inclined at an angle θ between 80° and 100° to the membrane surface axis were determined. As a result, with respect to this membrane, the directivity of the lamella to direction perpendicular to the membrane surface was determined to be 36%.

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Further, the results of X-ray analysis of the obtained thermally-set membrane (film) are as follows.

$$\cos 2MD(b)=0.204$$

$$\cos 2ND(b)=0.334$$

$$r(TD)=0.334/0.462=0.723$$

$$r(MD)=0.334/0.204=1.64$$

Detailed Discussion of the Results

As apparent from item 3 above, the thermally-set microporous membrane obtained in substantially the same manner as in EXAMPLE 2 of Kono et al. exhibits low air permeability of 1353 seconds/100 cc.

Further, with respect to this membrane, the directivity of the lamella to direction perpendicular to the membrane surface is lower than the lower limit 40% of the directivity defined in claim 1 of the present application, and the results of X-ray analysis do not satisfy the requirements recited in claim 9 of the present application.

Conclusion

As apparent from the above, the properties (particularly the air permeability) of the microporous polyolefin membrane obtained in substantially the same manner as in Kono et al. are disadvantageously poor, as compared to those of the microporous polyolefin membrane of the present invention.

Therefore, the microporous polyolefin membrane of the present invention is demonstrably different from that of Kono et al.

7) The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code

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and that willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed this ____ day of _____, 2004

Name

Title

TONEN CHEMICAL CORP.